CLAIMS

1. A coating composition comprising a film forming binder comprising

a. an acrylic polymer having pendant groups that are reactive with isocyanate moieties and having a glass transition temperature (Tg) of 10 to 80°C;

b. a polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000; and

c. an organic polyisocyanate crosslinking agent.

2. The coating composition of claim 1 wherein the binder comprises

a. 10 to 80 % by weight, based on the weight of the binder, of the acrylic polymer;

b. 1 to 50% by weight, based on the weight of the binder of polytrimethylene ether diol; and

c. 10 to 50% by weight, based on the weight of the binder, of an organic polyisocyanate crosslinking agent; and

wherein the sum of the percentages of a., b. and c. is 100%.

3. The coating composition of claim 2 wherein the polytrimethylene ether diol has a Mn 1,000 to 3,000, a Tg of approximately –75°C and a hydroxyl number of 20 to 200.

4. The coating composition of claim 2 wherein the polytrimethylene ether diol is a blend of high and low molecular weight ether diols wherein the high molecular weight diol has an Mn of 1,000 to 4,000 and the low molecular weight diol has an Mn of 150 to 500 and the average Mn of the blend is 1,000 to 3,000.

5. The coating composition of claim 1 wherein the polytrimethylene ether diol is formed via a bio conversion process.

6. The coating composition of claim 1 comprising in addition to the polytrimethylene ether diol, a branched or linear oligomer.

7. The coating composition of claim 2 wherein the acrylic polymer has a weight average molecular weight of 1,000 to 100,000 and a Tg of 10°C to 80°C and consists essentially of polymerized monomers selected from the group consisting of linear alkyl (meth)acrylates having 1-12 carbon atoms in the alkyl group, cyclic or branched alkyl (meth)acrylates having 3 to 12 carbon atoms in the alkyl group, isobornyl (meth)acrylate, styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers that provide groups reactive with isocyanate selected from the group consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group, glycidyl (meth)acrylates, hydroxy amino alkyl(meth)acrylates having 1 to 4 carbon atoms in the alkyl group, alkoxy silyl alkyl (meth)acrylate and (meth)acrylic acid.

8. The coating composition of claim 7 wherein the polyisocyanate is selected from the group consisting of aliphatic polyisocyanates, cycloaliphatic polyisocyanates, aromatic polyisocyanates, trifunctional isocyanates and isocyanate adducts.

9. The coating composition of claim 1 wherein the binder comprises

a. 35 to 55 % by weight, based on the weight of the binder, of the acrylic polymer;

b. 20 to 30% by weight, based on the weight of the binder of polytrimethylene ether diol; and

c. 20 to 45% by weight, based on the weight of the binder, of an organic polyisocyanate crosslinking agent and

wherein the sum of the percentages of a., b. and c. is 100% and the composition contains pigments in a pigment to binder weight ratio of 1/100 to 300/100.

10. The coating composition of claim 9 wherein the pigments are selected from the group consisting of titanium dioxide, iron oxide, silica, carbon black, baryte, zinc oxide, aluminum silicate, barium sulfate, zinc phosphate, lead silicate, clay, talc, hollow glass spheres and any mixtures thereof.

11. The coating composition of claim 9 wherein the acrylic polymer consists essentially of polymerized monomers selected from the group consisting of alkyl (meth)acrylates having 1 to 12 carbon atoms in the alkyl group, isobornyl methacrylate styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group.

12. The coating composition of claim 11 wherein the acrylic polymer consists essentially of styrene, ethylhexyl methacrylate, isobornyl methacrylate and hydroxyethyl methacrylate.

13. The coating composition of claim 9 wherein the polyisocyanate is selected from the group consisting of aliphatic polyisocyanates, cycloaliphatic polyisocyanates, aromatic polyisocyanates, trifunctional isocyanates and isocyanate adducts.

14. The coating composition of claim 13 in which the polyisocyanate is selected from the group consisting of isophorone diisocyanate, toluene diisocyanate, hexamethylene diisocyanate, diphenylmethane diisocyanate, triphenyl triisocyanate, benzene triisocyanate, toluene triisocyanate and the trimer of hexamethylene diisocyanate.

15. The coating composition of claim 9 containing 0.1 to 20% by weight, based on the weight of the binder, of an aminofunctional silane crosslinking agent having the formula

$$(X_n\ R)_aSi\text{-}(\text{-}OSi)_y\text{-}(OR^1)_b$$

wherein X is selected from the group consisting of $-NH_2$, $-NHR^2$, and SH, n is an integer from 1 to 5, R is a hydrocarbon group contain 1 to 22 carbon atoms, $R^1$is an alkyl group containing 1 to 8 carbon atoms, a is at least 1, y is from 0 to 20, b is at least 2 and R^2 is an alkyl group having 1 to 4 carbon atoms.

16. The coating composition of claim 15 wherein the aminofunctional silane is selected from the group consisting of N-beta-(aminoethyl)–gamma-aminopropyl trimethoxy silane and diethylene triamino propylaminotrimethoxy silane.

17. The coating composition of claim 9 containing an at least one additional amino functional compound selected from the group consisting of primary amines, secondary amines and tertiary amines.

18. A coating composition comprising a film forming binder of

a. an acrylic polymer having pendant groups that are reactive with isocyanate moieties and having a glass transition temperature (Tg) of 10 to 80°C;

b. a copolymer of polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000 comprising at least 50% by weight, based on the weight of the diol of polymerized 1,3-propane diol and up to 50% by weight, based on the weight of the diol of another polymerized alkane diol; and

c. an organic polyisocyanate crosslinking agent.

19. The coating composition of claim 18 wherein the binder comprises

a. 10 to 80% by weight, based on the weight of the binder, of an acrylic polymer having pendant groups that are reactive with isocyanate moieties and having a glass transition temperature (Tg) of 10 to 80°C;

b. 1 to 50% by weight, based on the weight of the binder of the copolymer of the polytrimethylene ether diol; and

c. 10 to 50% by weight, based on the weight of the binder, of an organic polyisocyanate crosslinking agent and

wherein the sum of the percentages of a., b. and c. is 100%.

20. The coating composition of claim 19 wherein the copolymer of polytrimethylene ether diol has a Mn 1,000 to 3,000, a Tg of approximately –75°C and a hydroxyl number of 20 to 200.

21. The coating composition of claim 20 wherein the copolymer of polytrimethylene ether diol is a blend of high and low molecular weight ether diols wherein the high molecular weight diol has an Mn of 1,000 to 4,000 and the low molecular weight diol has an Mn of 150 to 500 and the average Mn of the blend is 1,000 to 3,000.

22. The coating composition of claim 19 wherein the acrylic polymer has a weight average molecular weight of 5,000 to 50,000 and a Tg of greater than 10°C to 80°C and consists essentially of polymerized monomers selected from the group consisting of linear alkyl (meth)acrylates having 1 to 12 carbon atoms in the alkyl group, cyclic or branched alkyl (meth)acrylates having 3 to 12 carbon atoms in the alkyl group, isobornyl (meth)acrylate, styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers that provide groups reactive with isocyanate selected from the group consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group, glycidyl (meth)acrylates, hydroxy amino alkyl(meth)acrylates having 1-4 carbon atoms in the alkyl group, alkoxy silyl alkyl (meth)acrylate and (meth)acrylic acid.

23. The coating composition of claim 19 containing pigments in a pigment to binder weight ratio of 1/100 to 300/100.

24. A clear coating composition comprising a film forming binder consisting essentially of

a. 60 to 75% by weight, based on the weight of the binder, of the acrylic polymer;

b. 2.5 to 9.5% by weight, based on the weight of the binder of polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000; and

c. 22 to 31% by weight, based on the weight of the binder, of an organic polyisocyanate crosslinking agent and.

wherein the sum of the percentages of a., b. and c. is 100%.

25. The coating composition of claim 24 wherein the polytrimethylene ether diol is formed via a bio conversion process.

26. The coating composition of claim 24 wherein the acrylic polymer consists essentially of polymerized monomers selected from the group consisting of alkyl (meth)acrylates having 1 to 12 carbon atoms in the alkyl group, isobornyl methacrylate styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group.

27. The coating composition of claim 26 wherein the acrylic polymer consists essentially of styrene, ethylhexyl methacrylate, isobornyl methacrylate and hydroxyethyl methacrylate.

28. The coating composition of claim 24 wherein the polyisocyanate is selected from the group consisting of aliphatic polyisocyanates, cycloaliphatic polyisocyanates, aromatic polyisocyanates, trifunctional isocyanates and isocyanate adducts.

29. The coating composition of claim 24 containing 0.1 to 10% by weight, based on the weight of the binder, of ultraviolet light (UV) stabilizers from the group of UV absorbers, UV screeners, UV quenchers, hindered amine light stabilizers and optionally, 0.1 to 5% by weight, based on the weight of the binder, of antioxidants.

30. A coated substrate which comprises a substrate coated with a layer of the coating composition of claim 1.

31. The coated substrate of claim 30 wherein the substrate is selected from the group of steel ,aluminum, reinforced plastic and plastic.

32. A two component coating composition comprising

Component A an acrylic polymer having pendant groups that are reactive with isocyanate moieties and having a glass transition temperature (Tg) of 10 to 80°C; and a polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000; and

Component B an organic polyisocyanate crosslinking agent;

wherein Components A and B are thoroughly mixed together before application to a substrate.

33. A process which comprises applying a first layer of the composition of claim 1 to a substrate and drying said layer.

34. The process of claim 33 wherein the at least one additional layer comprises a pigmented color coat and optionally, a clear coat is applied.

35. A process for refinishing a damaged coating on a motor vehicle body which comprises applying a layer of the pigmented coating composition of claim 9 to damaged coating and at least partially curing the layer and then applying a second layer of a pigmented top coat or a layer

of a pigmented base coat and a layer of a clear coat and curing all of the layers to form a finish.

36. A process for refinishing a damaged coating on a motor vehicle body which comprises applying a layer of the pigmented coating composition to damaged coating and at least partially curing the layer and then applying a second layer of a pigmented base coat and a layer of a clear coat of the composition of claim 24 and curing all of the layers to form a finish.